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Until this week, we had concentrated our research activities mostly on the continental shelf of West Antarctica where our aims were focussed on the history of the glaciation and deglaciation in the Pine Island Bay.

An important component includes the influence of ocean currents on the advance and retreat of the ice-sheet across the continental shelf. It has been suspected that relatively warm deep ocean currents contribute to the accelerated retreat of the Pine Island and Thwaites Glaciers. Our measurements of temperature and salinity of the water in various depths off the ice-shelves of these glaciers, using a so-called CTD sonde, show indeed values which are higher than in front of other Antarctic ice-shelves. Is this difference sufficient to cause a faster glacier melting than elsewhere? In order to allow this process, the warm ocean currents must reach the grounding zones where the glaciers are grounded to the seafloor and where additional melt water is generated. It is yet beyond the technical feasibility during this expedition to reach these zones, which lie several kilometres from the ice-shelf front toward the mainland, with oceanographic sensors. However, the situation of ocean currents seems to change from season to season. In order to test this behaviour, our oceanographers Frank Nitsche from the USA and Raul Guerrero from Argentina deployed oceanographic moorings to measure temperature and salinity for the period of one year. In the next year, the U.S. research icebreaker Nathanial B. Palmer will come to this area and recover these moorings.

Our investigations this week in the deep sea off the continental shelf are also in the context with ocean currents, although with those of the past. Every time the Antarctic ice-sheet advanced to the outer continental shelf during glacial times, it bulldozed large quantities of coarse and fine rock material in front of it. In the form of so-called turbidite currents, this material slid down the steep continental slope into the deep sea. The fine sands, silt and mud form a suspension with water and are transported farther across the deep sea with bottom currents over hundreds of kilometres away from the slope. During this transport, the sediments are deposited on the seafloor and build so-called drifts which look similar to sand dunes on beaches or deserts. We shot a very long seismic profile in the deep sea along the continental margin this week in the hope to find these sediment drifts. The enthusiasm among the geophysicists was great when numerous drifts of various sizes appeared in the seismic records. An attempt will be performed with a detailed analysis of the data to reconstruct the paths of former bottom currents, because the knowledge of paths of former ocean currents includes important parameters to derive the Earth’s climate evolution of the past.

During this long seismic profile, we moved toward the Marie Byrd Seamounts. This area of the size of western Germany contains more than 40 submarine mounts which rise steeply up to 3000 m above the surrounding seafloor. They are probably of volcanic origin, but nobody has ever successfully collected rock samples from the cones. We began yesterday with a dredging program to collect rock samples form several of these seamounts. Prior to this sampling program, we again deployed our ocean-bottom seismometers for a deep crustal seismic profile. The goal was to derive information about how the Earth's crust in this area is affected by deep magmatic intrusions from the Earth's mantle. In addition, we fly helicopter-magnetic surveys to map magmatically and volcanically affected zones. In the tectonic past, this region was situated in the centre of the break-up between New Zealand and West Antarctica around 90 million years ago. If the rock samples reveal a much younger eruption age, we can assume that the volcanism followed the older tectonic faults zones, which were formed during the continental break-up. We also want to investigate if there is a connection between the seamount province and the volcanic eruption centres of the mainland where our geologists had collected samples. If the rock analyses reveal that the eruption age is relatively young, these volcanic provinces could have an effect on the stability of the West Antarctic ice-sheet due to a higher heat-flow from the Earth's crust. Thus, the understanding of the tectonic and volcanic history of Antarctica is in direct relationship to the development of models for the evolution of the Antarctic ice-sheet.

As for most parts of our expedition, we are accompanied by good weather which makes our work a bit easier. Yesterday's cocktail evening in the board bar Zillertal ended with the announcement that polar lights can be observed. As a result, Polarstern's observation deck was crowed in the middle of the night with everybody enjoying the wonderful nature scene.

With the very best regards from all cruise participants.

Karsten Gohl
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